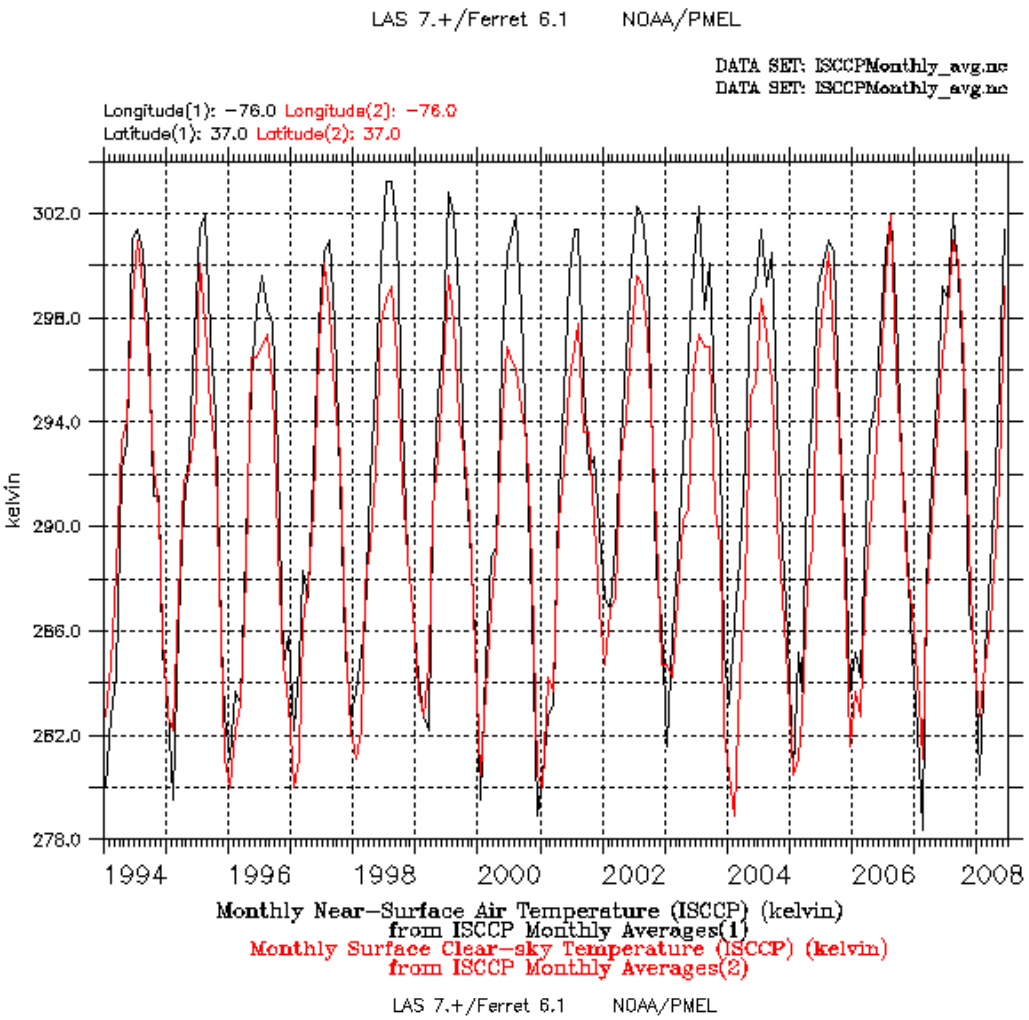
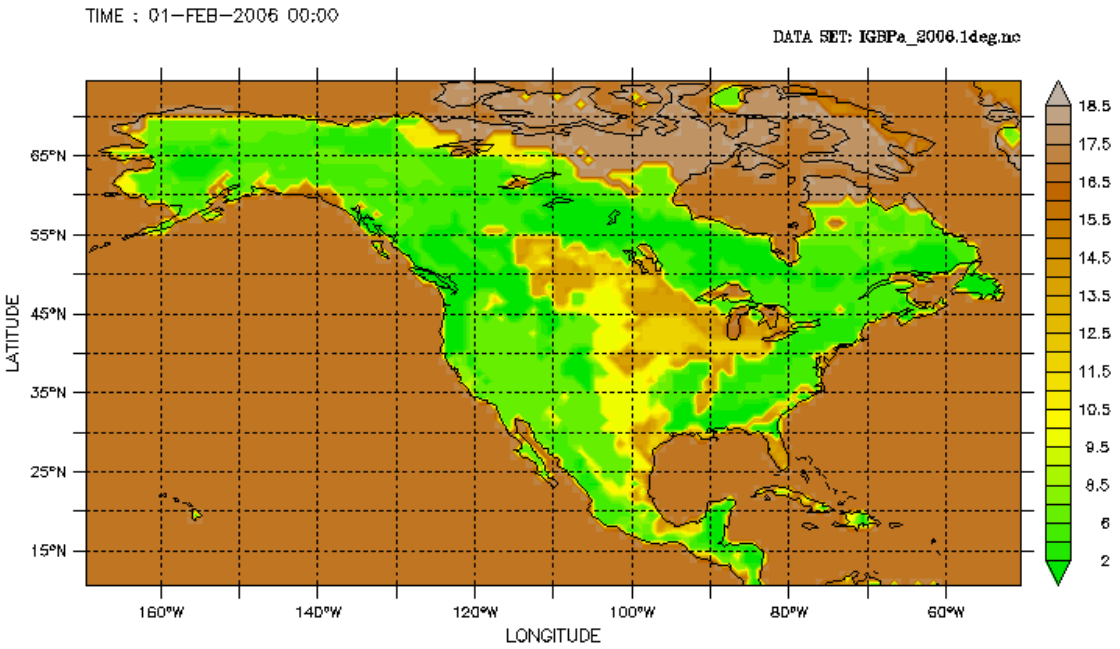
Lesson 43: Differences Between Ground and Air Temperatures (80)





Surface Scene Type (CERES/SARB) (dimensionless)

Questions:

1. Which color line is the ground temperature? Which color line is the air temperature?

Students should be able to read the legend and identify that the near-surface air temperature is the air temperature, and the surface clear-sky temperature is the ground temperature. In the example chart above, the black line is the air temperature and the red one is the ground temperature.

2. During which months is the ground temperature greater than the air temperature? During which months is it less?

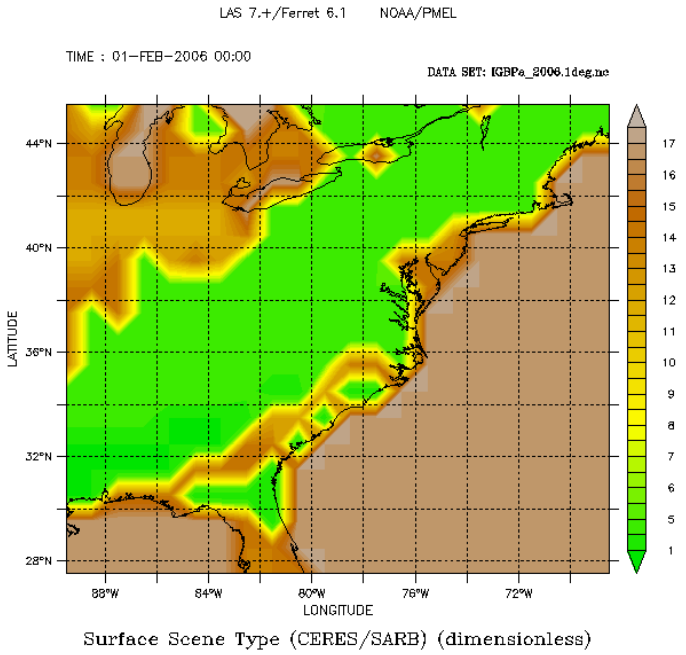
In order to identify which months are greater and which are less, if students chose a large time span they may need to create a new chart showing a more detailed display of each month. In the graph above, students can see that the ground and air temperature generally mirror each other, but sometimes the ground temperature is higher than the air temperature. When students look closer, it is clear that the ground temperature becomes close or becomes greater than the air temperature during the summer months, between June and August, and sometimes remains that way for the rest of the year. If a teacher has specified dates, students can look closely at certain years and should be able to read the chart and identify the individual differences between location and years.

3. What trends or patterns do you see in your graph?

Students should be able to identify the seasonal changes in temperature, and notice that in the graph above the air temperature and the ground temperature follow a similar pattern of increasing and decreasing. Students should be able to identify the seasonal changes that the graph shows, and be able to tell which months are the summer months (if in the southern hemisphere, should be warmer temperatures from December to February, but the opposite should hold true in the northern hemisphere).

4. What climate region or surface type is found at your location?

Students should look at the graph similar to the one shown above and match the color of their chosen location to the legend on the side of the graph. Students can then use lesson links to look up what that number means about climate region or surface type. In the example above, the longitude and latitude are around Hampton, Virginia, where NASA Langley Research Center is located. When looking up location students can create a new graph allowing a closer zoom on their location (see right). Hampton, Virginia, is located with a yellow-brown color, near the number eleven. This means it is in a permanent wetlands surface type.



5. Can you explain your results based on the surface type?

In this example students will notice that their results say that the air temperature is overall greater than the ground temperature. Students should see that it is a permanent wetlands, implying there is a lot of water in and on the ground in the area. Because of specific heat and the ability of water to absorb the heat through many layers, it does not heat up as quickly as land and because of this the surface temperature would be lower than the air temperature. If choosing a different area with different results, such as surface temperature consistently being more than air temperature, students should research specific heat and seasonal patterns in order to explain the differences.

Extensions:

1. Repeat the procedure choosing a different location that you know has a very different climate. Did you get different results?

Students may find it interesting to choose a location in a different hemisphere, and be able to observe the changes in seasonal temperatures. There should be different results found, students should use the same procedures as above to analyze the graph. It may be interesting to have each student choose a different location and then compare the differences between data on different places on the globe. Students can also compare differences in data when they have different locations or hemispheres but similar climate region or surface type situations.

2. Go outside to measure your ground temperature and air temperature. See if you get similar seasonal results to the satellite data. For guidance on how to measure ground and air temperature, see the Lesson Link for the GLOBE protocols.

3. Explore one of the inquiry-based Project Ideas found on the Citizen Scientist section of the MY NASA DATA website.